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Ref. # 10 CFR 52

June 13, 2012

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 3294 (SECTION 9.1.5), 6158 (SECTION 6.4), AND 6222 (SECTION 3.9.6)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein supplemental information for the response to Request for Additional Information (RAI) No. 3294 (CP RAI #52) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. Luminant also submits herein supplemental information for the response to RAI No. 6158 (CP RAI #240) and the response to RAI No. 6222 (CP RAI #244). The supplemental information addresses the heavy loads program, a figure that was inadvertently omitted from a response, and a reference to NUREG-1428.

Should you have any questions regarding the supplemental information, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

I state under penalty of perjury that the foregoing is true and correct.

Executed on June 13, 2012.

Sincerely,

Luminant Generation Company LLC

RD Bird for

Rafael Flores

Attachments:
1. Supplemental Response to Request for Additional Information No. 3294 (CP RAI #52)
2. Supplemental Response to Request for Additional Information No. 6158 (CP RAI #240)
3. Supplemental Response to Request for Additional Information No. 6222 (CP RAI #244)

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NRO

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Attachment 1

Supplemental Response to Request for Additional Information No. 3294
(CP RAI #52)

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3294 (CP RAI #52)

SRP SECTION: 09.01.05 - Overhead Heavy Load Handling Systems

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

DATE OF RAI ISSUE: 9/9/2009

QUESTION NO.: 09.01.05-1

Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.I.9.1.5 states that the applicant should describe the program and schedule for implementation of the program governing heavy load handling, including several bulleted items (see below) as listed in the RG 1.206.

NUREG-0800, Standard Review Plan (SRP) Section 9.1.5, "Overhead Heavy Load Handling Systems," and Section 5.1.1 of NUREG-0612, "Control of Heavy Load at Nuclear Power Plants," also describe heavy load handling guidelines.

As a minimum, Luminant should describe the program and schedule for heavy load handling including the following:

- A listing of all heavy loads and heavy load handling equipment outside the scope of loads described in the referenced certified design and the associated heavy load attributes (load weight and typical load path)
- Heavy load handling safe load paths and routing plans including descriptions of automatic and manual interlocks and safety devices and procedures to assure safe load path compliance
- Heavy load handling equipment maintenance manuals and procedures
- Heavy load handling equipment inspection and test plans
- Heavy load handling personnel qualifications, training, and control programs
- Quality assurance (QA) programs to monitor, implement, and ensure compliance with the heavy load handling program

A heavy load handling program that meets Section 5.1.1 of NUREG-0612, SRP Section 9.1.5 and RG 1.206 Section C.I.9.1.5 should be in place before there is a possibility that a load drop could cause a release of radioactivity, a criticality accident, an inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor.

Provide a description in the FSAR of the key elements of the heavy loads handling program at a level of detail similar to that of Section 5.1.1 of NUREG-0612, SRP Section 9.1.5, and RG 1.206. Include in the FSAR a description of the program areas that will be addressed by the procedures developed to cover load handling operations, a discussion on the establishment and use of safe load paths, programs or procedures for training and qualification of crane operator, programs or procedures for crane inspection testing and maintenance, and the heavy loads quality assurance program. In addition, provide a schedule as to when the procedures will be completed.

SUPPLEMENTAL INFORMATION:

In a conference call on May 9, 2012, the NRC staff asked for clarification of certain aspects of the heavy loads program for Comanche Peak Units 3 and 4. The FSAR description has been expanded in response to the conference call.

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 9.1-1, 9.1-2, 9.1-3, 9.1-4, and 9.1-5.

Impact on S-COLA

This response is standard.

Impact on DCD

None.

9.0 AUXILIARY SYSTEMS

9.1 FUEL STORAGE AND HANDLING

This section of the referenced design control document (DCD) is incorporated by reference with the following departures and/or supplements.

9.1.2.1 Design Bases

Replace the last sentence of the last paragraph in DCD Subsection 9.1.2.1 with the following.

STD COL 9.1(9) A procedure that will instruct the operator to perform formal inspection of the integrity of the spent fuel racks will be established prior to first fuel load.

~~9.1.5.3 Safety Evaluation~~

RCOL2_09.01.05-1 S01

~~Replace the last paragraph in DCD Subsection 9.1.5.3 with the following.~~

~~STD COL 9.1(6)~~ ~~To assure proper handling of heavy loads during the plant life, a Heavy Load Handling Program, including associated procedural and administrative controls, will be established prior to first fuel load. The program will satisfy commitments made in Subsection 9.1.5 of the DCD, and meet the guidance of ANSI/ASME B30.2, ANSI/ASME B30.9, ANSI N14.6, ASME NOG-1, CMMA Specification 70-2000, NUREG-0554, NUREG-0612, and NUREG-0800, Section 9.1.5. The Heavy Load Handling Program will include consideration of temporary cranes and hoists. The Heavy Load Handling Program will adopt a defense-in-depth strategy to enhance safety when handling heavy loads. For instance, the program will restrict lift heights to practical minimums and limit lifting activities as much as practical to plant modes in which load drops have a small potential for adverse consequences, particularly when critical loads are being handled. Further, prior to the lifting of heavy loads after initial fuel loading, the program will institute additional reviews to assure that potential drops of these loads due to inadvertent operations or equipment malfunctions, separately or in combination, will not jeopardize safe shutdown functions, cause a significant release of radioactivity, a criticality accident, or inability to cool fuel within the reactor vessel or spent fuel pit.~~

9.1.5 Overhead Heavy Load Handling System

Add the following at the end of DCD Subsection 9.1.5.

STD COL 9.1(6) To assure proper handling of heavy loads during plant life, a Heavy Load Handling Program, including associated procedural and administrative controls, will be

established prior to first fuel load. The program is based on NUREG-0612 and vendor recommendations with the following key elements: RCOL2_09.01.05-1 S01

- List of heavy loads, both critical and noncritical, to be lifted during operation of the plant. This list will be provided once magnitudes of the loads have been accurately formalized but no later than three months prior to first fuel load.
- List of heavy load handling equipment, including those outlined in DCD Table 9.1.5-4 whose characteristics are described in DCD Subsection 9.1.5.
- Heavy load handling safe load paths and routing plans, including descriptions of interlocks (automatic and manual), safety devices, and procedures to assure safe load path compliance. Anticipated heavy load movements are analyzed and safe load paths defined. Safe load path considerations are based on comparison with analyzed cases, previously-defined safe movement areas, and previously-defined restricted areas. The analyses are in accordance with Appendix A of NUREG-0612.
- Heavy load handling equipment maintenance manuals and procedures as described in Subsection 9.1.5.6.
- Heavy load handling equipment inspection and test plans as outlined in Subsections 9.1.5.4 and 9.1.5.6.
- Heavy load handling personnel qualifications, training, and control procedures as described in Subsection 9.1.5.6.
- QA programs to monitor, implement, and ensure compliance with the heavy load handling procedures as described in Subsection 9.1.5.6.

A QA program consistent with Paragraph 10 of NUREG-0554 is established and implemented for the procurement, design, fabrication, installation, inspection, testing, and operation of single-failure-proof cranes. The program includes the following elements as a minimum:

- design and procurement document control
- instructions, procedures, and drawings
- control of purchased material, equipment, and services
- inspection
- testing and test control

- non-conforming items
- corrective action
- records

RCOL2_09.01.05-1 S01

9.1.5.1 Design Bases

Replace the last sentence in the fifth paragraph of DCD Subsection 9.1.5.1 with the following.

Both noncritical and critical heavy load lifts will be evaluated and documented in the manner described in Subsection 9.1.5.

9.1.5.3 Safety Evaluation

Replace the last paragraph in DCD Subsection 9.1.5.3 with the following.

Over the plant life there may be occasions when heavy loads not previously addressed need to be lifted in support of special maintenance/repairs. For these occasions, special procedures are generated that address the following as a minimum:

- The special procedures comply with NUREG-0612.
- A safe load path is determined. Mechanical and/or electrical stops are incorporated in the hardware design to prohibit travel outside the safe load path. Maximum lift heights are specified to minimize the impact of an unlikely load drop.
- The consequence of the load drop is evaluated where a load drop could occur over irradiated fuel or safe shutdown equipment. If the evaluation concludes that the load drop is not acceptable, an alternate path is evaluated, or the lift is prohibited.
- The lifting equipment is in compliance with applicable ANSI standards and has factors of safety that meet or exceed the requirements of those standards.
- Operator training is provided prior to actual lifts.
- Inspection of crane components is performed in accordance with the manufacturer recommendations.

RCOL2_09.01.05-1 S01

9.1.5.4 Inspection and Testing Requirements

Add the following at the end of DCD Subsection 9.1.5.4.

The above requirements are part of the plant inspection program for the OHLHS, which is implemented through procedures. In addition to the above inspections, the procedures reflect the manufacturers' recommendations for inspection and NUREG-0612 recommendations.

The overhead heavy load handling equipment inservice inspection procedures address the following as a minimum:

- Identification of components to be examined
- Examination techniques
- Inspection intervals
- Examination categories and requirements
- Evaluation of examination results

The overhead heavy load handling program, including system inspections, is implemented prior to first fuel load.

Add the following paragraph after DCD Subsection 9.1.5.6.

9.1.5.6 Load Handling Procedures

Load handling operations for heavy loads that are handled over, could be handled over, or are in the proximity of irradiated fuel or safe shutdown equipment are controlled by written procedures. As a minimum, procedures are used for handling loads with the spent fuel cask bridge and polar cranes, and for those loads listed in Table 3.1-1 of NUREG-0612. The procedures include and address the following elements:

- Specific equipment required to handle the load (special lifting devices, slings, shackles, turnbuckles, clevises, load cells, etc.).
- Qualification and training of crane operators and riggers in accordance with Chapter 2-3.1 of ASME B30.2, "Overhead and Gantry Cranes."
- Requirements for inspection and acceptance criteria prior to load movement.

- The defined safe load path and provisions to provide visual reference to the crane operator and/or signal person of the safe load path envelope. RCOL2_09.01.05-1 S01

- Specific steps and proper sequence to be followed for handling load.

- Precautions, limitations, prerequisites, and/or initial conditions associated with movement of heavy loads.

- Testing, inspection, acceptance criteria and maintenance of OHLHS. These procedures are in accordance with manufacturer recommendations and are consistent with ANSI B30.2 or with other appropriate and applicable ANSI standards.

Safe load paths are defined for movement of heavy loads to minimize the potential for a load drop on irradiated fuel in the reactor vessel, spent fuel pool or safe shutdown equipment. Paths are defined clearly in procedures and equipment layout drawings. Equipment layout drawings showing the safe load path are used to define safe load paths in load handling procedures. Deviation from defined safe load paths requires a written alternative procedure approved by the plant safety review committee.

9.1.6 Combined License Information

Replace the content of DCD Subsection 9.1.6 with the following.

9.1(1) *Deleted from the DCD.*

9.1(2) *Deleted from the DCD.*

9.1(3) *Deleted from the DCD.*

9.1(4) *Deleted from the DCD.*

9.1(5) *Deleted from the DCD.*

STD COL 9.1(6) ***9.1(6)*** *The establishment of a Heavy Load Handling Program*

This COL item is addressed in Subsection 9.1.5.~~3.~~ CTS-01438 RCOL2_09.01.05-1 S01

9.1(7) *Deleted from the DCD.*

9.1(8) *Deleted from the DCD.*

STD COL 9.1(9) ***9.1(9)*** *The establishment of an inspection procedure of spent fuel rack integrity*

This COL item is addressed in Subsection 9.1.2.1. CTS-01438

Attachment 2

Supplemental Response to Request for Additional Information No. 6158
(CP RAI #240)

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 6158 (CP RAI #240)

SRP SECTION: 06.04 - Control Room Habitability System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 11/15/2011

QUESTION NO.: 06.04-15

This is follow-up RAI to RAI Letter No. 172 (4678) Question 06.04-9.

In Question 06.04-9, the staff asked a four part question that prompted the applicant to perform a sensitivity analysis to justify and show the effects of changes to the original analysis described in FSAR subsection 6.4.4.2 (i.e. the bounding case above). The applicant responded on October 6, 2010 (ADAMS Accession ML102810224) with the outcomes of changing the inputs of (1) control room intake height; (2) solar radiation and maximum ambient dry bulb temperature; and (3) stability class and wind speed. The staff verified that Revision 2 of RCOLA FSAR subsection 6.4.4.2 contained the outcomes of these sensitivity analyses. The staff performed confirmatory modeling for all the applicant's findings of FSAR Table 2.2-214 and replicated the sensitivity analysis described above.

In addition, the staff performed HABIT modeling for extended runs beyond the applicant's HABIT models which were programmatically limited by timing out (e.g. 12.5 minutes for chlorine). The results of the staff's HABIT modeling of the chlorine accident yielded a MCR concentration still below the IDHL limits but not substantially below. In particular, for the extended run modeling of the chlorine event the staff used an elevated MCR intake of 14.3 meters and a 5% exceedance temperature [i.e. 36.11°C (97°F)]. This model resulted in a maximum peak MCR concentration equal to 8.8 ppm which occurred at 28.25 minutes into the event. This lack of significant margin prompted further investigation by the staff. The staff notes that the ALOHA manual defines a heavy gas as "*A gas that has a molecular weight greater than that of air (the average molecular weight of air is about 29 kilograms per kilomole) will form a heavy gas cloud if enough gas is released.*" Chlorine with a molecular weight of 70.9 grams/mole fits the definition of a heavy gas. Based on this, the staff modeled in ALOHA the chlorine event as a heavy gas based on a 5% exceedance temperature and other parameters similar to the HABIT modeling. The staff notes that there is one limitation of the ALOHA model in that MCR intake elevations cannot be factored into the model. The ALOHA heavy gas model for the chlorine event yielded a peak internal building concentration of 46.5 ppm occurring at approximately 25 minutes into the event. Internal building concentration for this chlorine model exceeded the IDHL limit of 10 ppm at approximately 18 minutes into the event.
In light of the comparative results of the HABIT versus ALOHA modeling for chlorine, the staff produced a ALOHA heavy gas model for a 93% by weight sulfuric acid solution. The molecular weight of a sulfuric acid solution equals 98.1 grams/mole with an IDHL of 15 mg/m^3.

The ALOHA heavy gas model for sulfuric acid assumed a continuous release over 60 minutes and used a 5% exceedance temperature and a stability class consistent with Regulatory Guide 1.78 guidance. The results of the ALOHA heavy gas analysis for sulfuric acid yielded an indoor concentration of 8,090 mg/m^3 at 60 minutes with an onward (beyond the graph) slope of 10-15° rising. It appears that the IDLH within the building at ground level (i.e. not representative of an elevated MCR) could be exceeded at about 5 minutes after the event (i.e. sulfuric tank rupture). As a point of comparison, the staff ran a HABIT model adhering to the temperature and stability class guidance of RG 1.78. A non-elevated MCR intake and a "Liquid Tank Burst" were also assumed. The staff's Habit run, timed out at 18.9 min with both the external and internal concentrations still slowing rising. At 18.9 min the CRE concentration was up to 5.082E-2 mg/m^3. The IDHL is 15 mg/m^3.

The staff also notes that both the applicant's and the staff's HABIT modeling illustrate the sensitivity of the EXTRAN results to the parameter of MCR intake height. The staff believes that the MCR HVAC intake height used in the habitability analyses needs to be captured as a plant attribute in FSAR 6.4.4.2 "Toxic Gas Protection". The staff requests that the applicant revise FSAR 6.4.4.2 accordingly.

In summation, the staff posits that since chlorine and sulfuric acid clearly fit the definition of a heavy gas that ALOHA modeling is the more appropriate program (i.e. as opposed to HABIT) to use for determining MCR habitability. More specifically, the use of the HABIT Gaussian model may be producing non-conservative results for these two heavy gases. The staff requests that the applicant re-evaluate their findings of FSAR 6.4.4.2 and address the fact that chlorine and sulfuric acid are heavy gases and provide a comprehensive justification for why the results are appropriate and conservative.

SUPPLEMENTAL INFORMATION:

This is the response to RAI No. 6158 (CP RAI #240) Question 06.04-15 that was submitted on March 29, 2012 (ML12093A002). However, Figure 1 discussed under "Virtual Source Calculation" below was inadvertently omitted in that submittal. The figure has been reinstated below and the complete response is provided again for ease of review.

<u>Chlorine IDLH</u>

The IDLH limit for chlorine is 10 ppm and is inherently conservative since it provides significant margin for the safety of the operators. For example, the NIOSH (National Institute for Occupational Safety Health) "Documentation for Immediately Dangerous To Life or Health Concentrations (IDLHs)" for chlorine indicates an original IDLH of 30 ppm based on "exposure to 30 ppm will cause intense coughing fits, and exposure to 40 to 60 ppm for 30 to 60 minutes or more may cause serious damage".

However, RG 1.78, Rev. 1, states:

> The IDLH value or limit, based on a 30-minute exposure level, is defined as one that is likely to cause death or immediate or delayed permanent adverse health effects if no protection is afforded within 30 minutes. For each chemical considered, the IDLH limit can be tolerated for 2 minutes without physical incapacitation (for example, severe coughing, eye burn, or severe skin irritation) of an average human. Thus, a 2-minute exposure to the IDLH limits provides an adequate margin of safety in protecting control room operators, and these limits are recommended.

Accordingly, the NIOSH original IDLH limit of 30 ppm appears to be more consistent with the RG intent and can be used to illustrate significant margins.

Perhaps most importantly, RG 1.78 states:

> It is expected that a control room operator will take protective measures within 2 minutes (adequate time to don a respirator and protective clothing) after the detection and, therefore, will not be subjected to prolonged exposure at the IDLH concentration levels. If toxicity limits of released chemicals are not available and no detection instruments are available in the control room for the hazardous chemicals under consideration, the human detection threshold, such as the odor threshold, may be used.

In addition to the above conservatism in using an IDLH limit of 10 ppm, the modeling of the event also utilizes significant conservatisms, including:

- Postulation of a full chlorine release from a maximum capacity truck accident at the highway location of closest approach to the control room intake
- Postulation of meteorological characteristics representative of the worst five percent (per RG 1.78) or of even lower probability conditions (for example, worst lower percentage temperatures, utilization of zero cloud cover conditions, etc.)
- Control room intake conditions representative of worst-case intake flow combined with worst-case postulated infiltration, with no operator action assumed to reduce these.
- No control room operator notification of the initiation of the event prior to event determination by the odor detection threshold.
- No credit for the significant dispersion effects of building wakes in the vicinity of the control room intake.

Accordingly, the critical parameter for operator safety is not the peak MCR concentration, but whether the time between the odor detection threshold and the IDLH limit exceeds 2 minutes (0.08 ppm for chlorine per NUREG/CR-6624, as noted in the referenced applicant response to RAI 4678). The analyses described below were performed to show that sufficient time is available for the operators to take protective measures to avoid prolonged exposure per RG 1.78.

Heavy Gas Dispersion Methodology

Based on the definition of a "heavy gas" in the ALOHA User's Manual (The CAMEO Software System – ALOHA User's Manual, dated February 2007), the postulated release of chlorine gas fits the definition of a heavy gas. However, the ALOHA model has the limitation that MCR intake elevations cannot be factored into the model because ALOHA calculations are based on a "flat-earth" model.

In addition, per the ALOHA manual, the diffusion behavior of a dense gas becomes neutrally buoyant (i.e., Gaussian) after the diffused gas concentration reaches 1%. From the ALOHA manual:

> When a gas that is heavier than air is released, it initially behaves very differently from a neutrally buoyant gas. The heavy gas will first "slump," or sink, because it is heavier than the surrounding air. As the gas cloud moves downwind, gravity makes it spread; this can cause some of the vapor to travel upwind of its release point. Farther downwind, as the cloud becomes more diluted and its density approaches that of air, it begins behaving like a neutrally buoyant gas. This takes place when the concentration of heavy gas in the surrounding air drops below about 1 percent (10,000 parts per million).

Given this fact and the limitation of ALOHA noted above, a combined "virtual source" approach was performed to utilize the combined features of ALOHA and HABIT.

For the virtual source approach, the heavy gas dispersion model in ALOHA was initially used to determine the distance ($D_{1\%HG}$) from the postulated chlorine source to the nearest location where a 1% resulting heavy gas chlorine concentration was reached. This acknowledges the heavy gas behavior for concentrations above 1%. Next, a similar distance ($D_{1\%NB}$) to 1% concentration for a neutrally buoyant gas was evaluated with HABIT and subtracted from the previous distance. This acknowledges the transition between the two behaviors as concentration approaches 1% (i.e., the heavy gas does not spontaneously transition to neutrally buoyant). Finally, a full neutrally buoyant chlorine release was then assumed to occur at a virtual source location closer to the control room than the actual postulated chlorine source. This virtual source was moved closer by an amount equal to the difference in the two distances ($D_{1\%HG}$ - $D_{1\%NB}$) calculated above and the virtual source was evaluated using HABIT. This virtual source evaluation in HABIT acknowledges neutrally buoyant behavior for low concentrations and its effect for an elevated control room intake.

As an additional note, the calculations below were performed with ALOHA v5.4.2. Per discussions with the software developer (National Oceanic and Atmospheric Administration), this version modified the reference height for the wind speed profiles in the code calculation. This change was found to produce conservatively higher concentration results compared to the previous version (v5.4.1.2).

Virtual Source Calculation

The heavy gas dispersion model in ALOHA was used to determine the distance from the postulated chlorine source to the nearest location where a 1% resulting heavy gas chlorine concentration was reached under the worst-case conditions stated in the RAI. This evaluation used Pasquill Stability Class F, which is the worst-case Stability Class permitted by ALOHA. (Note that per the ALOHA manual, such stable atmosphere conditions are conservatively inconsistent with the strong solar heating conditions postulated at a 5% exceedance temperature of 36.11°C or 97°F). This distance ($D_{1\%HG}$) from the source was found to be 606 meters, while the total horizontal distance from the postulated chlorine source to the nearest control room intake is 2253 meters.

Next, HABIT runs were made at F stability and a range of wind speeds from 1 to 6 meters/second to find the worst-case distance where HABIT predicts this same 10,000 ppm concentration with its Gaussian model ($D_{1\%NB}$). This distance was calculated to be 178 meters, resulting in a final offset for the virtual source of 428 meters (606 – 178 meters). The HABIT analysis was then re-run for all wind speeds, including 2.5 meters/second, at this distance of 1825 meters (2253 – (606 – 178) meters) to the nearest control room intake with credit for the 14.3 meter control room elevation. The resulting true virtual source modeling gave MCR results as shown on the following Figure 1 plot. The plot shows the time available for a control room operator to detect a release at the odor threshold (0.08 ppm) and then take protective measures before the IDLH of a MCR concentration of 10 ppm is reached is always over 12 minutes. This is well over the 2 minutes considered by RG 1.78 as adequate time before the IDLH of a MCR concentration of 10 ppm is reached.

Accordingly, this analysis indicates the sufficiency of the previous evaluations. FSAR Section 6.4 has been revised to describe the above chlorine results. FSAR Subsection 6.4.4.2 has also been revised to add the MCR HVAC intake height (14.3 meters) that was used in the habitability analyses in order to recognize the importance of an elevated intake to provide protection for the operators.

Sulfuric Acid Modeling

Per RG 1.78, 10 torr is the vapor pressure threshold that determines the need for consideration of flashing and boil off in liquid spill release determinations; chemicals with such a low vapor pressure (<10 torr) are not considered to result in significant atmospheric gaseous releases. The vapor pressure of a sulfuric acid solution at normal temperatures is approximately 0.001 torr. Accordingly, with such a

negligible vapor pressure, sulfuric acid solutions can be screened out from consideration for control room habitability evaluation.

Impact on R-COLA

See attached mark-up FSAR Revision 2 pages 6.4-2 and 6.4-3.

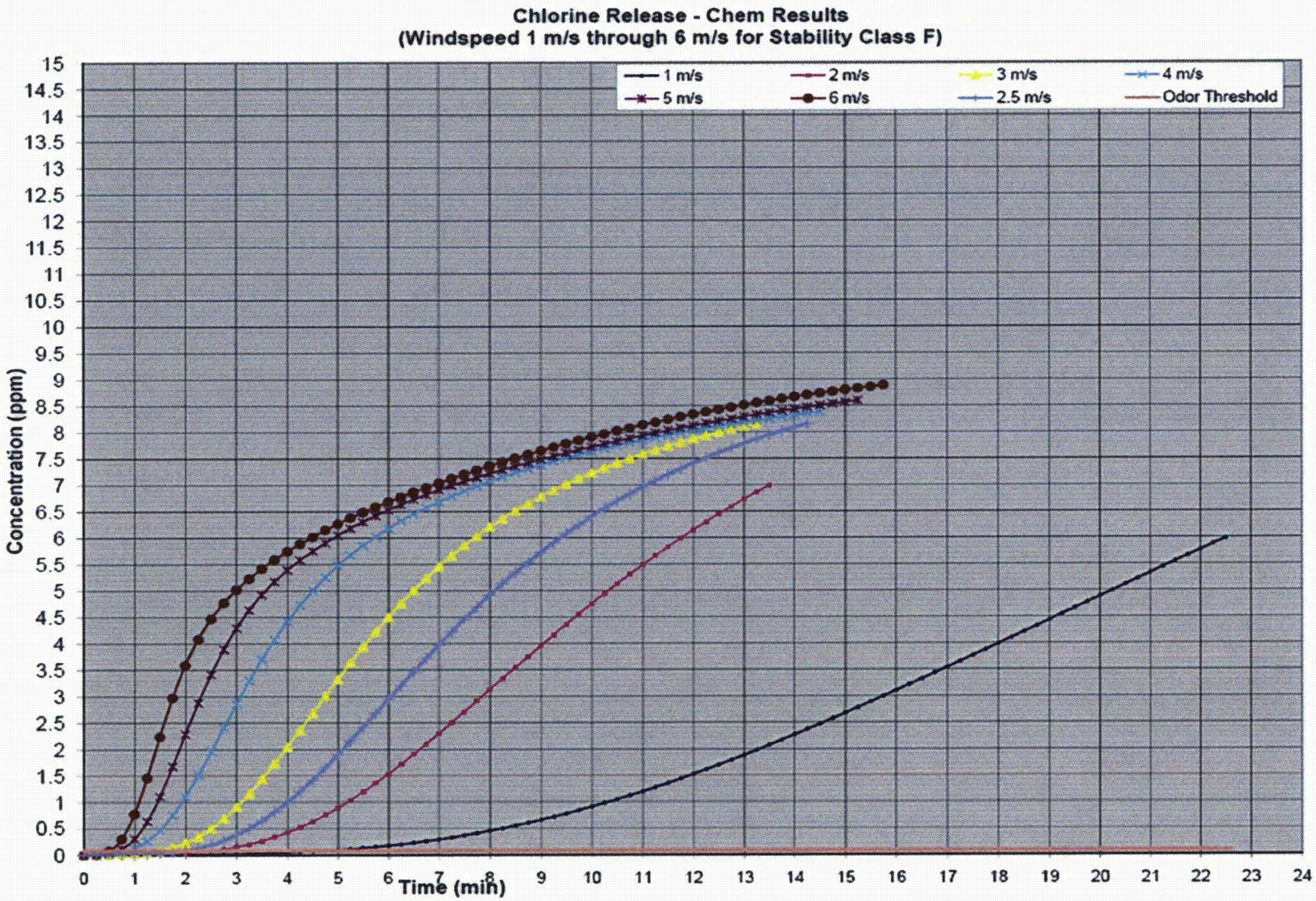
Impact on S-COLA

None.

Impact on DCD

None.

Figure 1 – MCR Chlorine Concentrations for Virtual Source Method



requirements of RG 1.78. Chemicals, including chemicals in Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2, are identified and screened as described in Subsection 2.2.3.1.3.

Several hazardous chemicals exceed the screening criteria provided in RG 1.78 and an analysis is required to determine control room concentrations. Toxic chemicals that do not meet RG 1.78 screening criteria are identified in Table 2.2-214, and calculated maximum control room concentrations of each chemical are also described in Table 2.2-214. Using conservative assumptions and input data for chemical source term, CPNPP Units 3 and 4 control room parameters, site characteristics, and meteorology inputs, postulated chemical releases are analyzed for maximum value concentration to the MCR using the HABIT code, version 1.1. RG 1.78 specifies the use of HABIT ~~1.1~~ software for evaluating control room habitability. HABIT software includes modules that evaluate radiological and toxic chemical transport and exposure. For this analysis of chemical release concentrations, EXTRAN, and CHEM modules are utilized in the code. EXTRAN models toxic chemical transport from the selected release point to the ~~heating, ventilation, and air conditioning (~~HVAC~~)~~ intake for the MCR, considered at a bounding height of 14.3 meters above an assumed ground level release (i.e., conservatively lower than the bottom elevation of the fresh air intake missile shield). CHEM is then applied by HABIT to model chemical exposure to control room personnel, based on EXTRAN output and MCR design parameters. RCOL2_06.04-15 RCOL2_06.04-15

The meteorological conditions assumed for these cases were initially set at G stability and 2.5 m/s wind speed, which is more extreme than 95th percentile for the CPNPP site. The 2.5 m/s wind speed is higher than would be expected for G stability but is conservative in that it introduces the chemical gas into the intakes faster than at lower speeds. The analyses are thus bounding. Lower concentrations are calculated on average using F stability and results for a range of wind speeds and worst case conditions are also presented below as a sensitivity analysis.

The HABIT-based analysis determines the peak concentration in the MCR and compares this level to the RG 1.78 criterion, the specific chemical listed immediately dangerous to life and health (IDLH). In the cases that were analyzed, all postulated releases led to concentrations that are ~~well~~ below the IDLH level. Values of IDLH for various chemicals are found in NUREG/CR-6624 (Reference 6.4-201). RCOL2_06.04-15

The most limiting case, or the one that leads to the highest control room concentration relative to the IDLH, is the tanker truck release of chlorine on Highway FM 56, at a distance of closest approach to CPNPP Units 3 and 4 MCR intake of 1.4 miles. Chlorine is used for this case because it is one of the most hazardous Department of Transportation approved chemicals, and bounds other chemicals by toxicity, dispersibility, and quantity that may use public transportation such as Highway FM 56. Using the methodology prescribed by RG 1.78, as well as the heavy gas modeling in ALOHA, the ~~HABIT initial~~ analysis ~~for G stability and 2.5 m/s wind speed~~ showed MCR concentration remains below ~~5.7~~10 ppm ~~at~~ RCOL2_06.04-15

~~equilibrium in the MCR~~throughout the evaluated transient under all conditions. ~~This concentration (5.7ppm) is less than t~~The IDLH concentration for chlorine ~~(~~is 10 ppm~~)~~. ~~The concentration at the MCR HVAC intakes, that is the concentration of outside, will exceed the IDLH (10 ppm) at about 2.5 minutes, remain elevated until approximately 7 minutes, and then start decreasing slowly on a scale based on the volume and ventilation rates in the MCR.~~ RCOL2_06.04-15

For Class F stability and the worst case sensitivity analysis conditions of an intake height of 0 m, solar radiation of 1150 W/m^2, a wind speed of 6 m/s, air and ground temperature of 115 °F, and cloud cover of 0 tenths, the concentration in the MCR reaches the human detection threshold for chlorine (0.08 ppm) at approximately 0.25 minutes and reaches the maximum concentration (8.0 ppm) in approximately 16 minutes. Additional sensitivity analyses were performed with the heavy gas model in ALOHA combined with HABIT to model a "virtual source" at the distance from the release location where the released gas behaves as a neutrally buoyant gas. The sensitivity results confirmed the previous analysis results. RCOL2_06.04-15

RG 1.78 states that it is expected that a control room operator will don a respirator and protective clothing, or take other mitigating action within two minutes after detection. Also during a toxic gas emergency, the control room operators have the option of manually actuating the emergency isolation mode of the MCR HVAC System.

All of the FSAR Table 2.2-214 assumed chemical releases were analyzed with the HABIT code, and produce maximum control room concentration values~~well~~ below the IDLH. Therefore, there will be no procedure requiring operator action, either donning respirators and protective clothing or manually isolating the control room HVAC System. Both of these response actions will be considered at the discretion of the operators in the event of a toxic gas release. The CPNPP Units 3 and 4 Emergency Plan includes provisions for maintaining self-contained breathing apparatuses (SCBAs) in the control room. A toxic gas release is within the scope of procedures addressed by FSAR Subsection 13.5.2. Training is addressed in the CPNPP Emergency Plan and in Subsection 13.2 of the FSAR. RCOL2_06.04-15

Periodic surveys are conducted for onsite chemicals annually and for offsite at least once every three years for stationary and mobile sources of hazardous chemicals within a five mile radius of the plant in accordance with Regulatory Guide 1.196 Regulatory Position 2.5. In addition, prior to use, chemicals and chemicals of potential impact (halogenated gas or liquid products to be purchased in quantities of 100 pounds or greater) require a Control Room Habitability assessment. Procedures to implement these periodic surveys and chemical evaluations are developed per Subsection 13.5.2.2.

ITAAC (Tier 1 Section 2.7.5.1.2) and pre-operational tests (Tier 2 Subsection 14.2.12.1.101) address CRE integrity and verify the functional arrangement of MCR HVAC equipment and systems in adjacent areas with the design description, in accordance with RG 1.196. Operating and maintenance procedures as mentioned in FSAR Section 13.5 address periodic assessment of the control room

Attachment 3

Supplemental Response to Request for Additional Information No. 6222
(CP RAI #244)

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 6222 (CP RAI #244)

SRP SECTION: 03.09.06 - Functional Design Qualification and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 12/14/2011

QUESTION NO.: 03.09.06-22

As a supplement to RAI 2772 question 03.09.06-2, the NRC staff requested in RAI 6027 question 03.09.06-14 that the Comanche Peak COL applicant confirm that the Comanche Peak FSAR combined with the US-APWR DCD provides a full description of the IST program for pumps, valves, and dynamic restraints for Comanche Peak Units 3 and 4. The staff requested that the Comanche Peak COL applicant submit any planned modifications to the Comanche Peak FSAR to fully describe the IST program where the US-APWR DCD provisions need to be supplemented. The staff also requested that the Comanche Peak COL applicant clarify the reference to Nonmandatory Appendix A, "Preparation of Test Plans," of the ASME OM Code in the Comanche Peak FSAR to specify that the IST program for Comanche Peak Units 3 and 4 must satisfy the ASME OM Code, as incorporated by reference in 10 CFR 50.55a.

In its response to RAI 6027 question 03.09.06-14, the Comanche Peak COL applicant stated that the planned revisions to the US-APWR DCD by MHI will provide a full description of the IST program for Comanche Peak Units 3 and 4. The Comanche Peak COL applicant also stated that MHI plans to revise the US-APWR DCD to delete the reference to the ASME OM Code, Appendix A, and that a similar change will be made to the Comanche Peak FSAR. Since submittal of the Comanche Peak response, MHI has indicated plans to revise the US-APWR DCD to specify in a COL Information Item that the COL applicant is responsible for fully describing the IST program for pumps, valves, and dynamic restraints.

As a supplement to RAI 03.09.06-14, the NRC staff requests that the Comanche Peak COL applicant revise the Comanche Peak FSAR to respond to the COL Information Item by referencing the provisions in the US-APWR DCD and specifying any plant-specific information in the Comanche Peak FSAR to provide a full description of the IST program for pumps, valves, and dynamic restraints to be used at Comanche Peak Units 3 and 4. The staff also requests that the Comanche Peak COL applicant clarify its response to RAIs 03.09.06-15 and 16 regarding the COL Information Item as part of its response to this supplemental RAI.

SUPPLEMENTAL INFORMATION:

In response to NRC feedback on the response to this RAI, Luminant has removed references to NUREG-1482 Revision 2 from the FSAR. NUREG-1482 is incorporated by reference from the DCD (Ref. 3.9-60) and Luminant will use this reference to NUREG-1482.

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 3.9-2, 3.9-3, and 3.9-6.

Impact on S-COLA

This response is standard.

Impact on DCD

None.

The design specification for snubbers installed in harsh service conditions (e.g., high humidity, temperature, radiation levels) is evaluated for the projected life of the snubber to assure snubber functionality including snubber materials (e.g., lubricants, hydraulic fluids, seals).

3.9.6 Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

STD COL 3.9(6) STD COL 3.9(8) ~~Replace the second sentence of the third paragraph in DCD Subsection 3.9.6 with the following.~~Replace the seventh paragraph in DCD Subsection 3.9.6 with the following. RCOL2_03.09.06-15 MAP-03-401 CTS-01435

~~The inservice testing (IST) program for pumps, valves, and dynamic restraints is administratively controlled to ensure that the equipment will be capable of performing its safety function throughout the life of the plant.~~The US-APWR utilizes the ASME OM Code, 2004 Edition through the 2006 Addenda (or the optional ASME Code Cases listed in NRC RG 1.192 that is incorporated by reference in paragraph (b) of 10 CFR 50.55a, subject to the applicable limitations and modifications) (Reference 3.9-13) for developing the IST Program for ASME Code, Section III, Class 1, 2 and 3 safety-related pumps, valves and dynamic restraints in US-APWR Subsection 3.9.6. The inservice testing (IST) program for pumps, valves, and dynamic restraints including the ASME OM Code edition and addenda to be used for the IST program is administratively controlled to ensure that the equipment will be capable of performing its safety function throughout the life of the plant.

Inservice Testing Program Description RCOL2_03.09.06-22 CTS-01396

The CPNPP Units 3 and 4 IST program incorporates the IST program described in US-APWR DCD Section 3.9.6 and its subsections as expanded in this FSAR subsection. The IST program is developed in accordance with the requirements delineated in ASME Code Section XI Rules for Inservice Inspection of Nuclear Power Plant Components, the ASME OM Code, the plant Technical Specifications, and good engineering practices. The IST relies on baseline information obtained during plant construction and startup testing. The program is implemented in general conformance with NUREG-1482 (Reference 3.9-60), Guidelines for Inservice Testing at Nuclear Power Plants. ~~[also see NUREG-1482, Revision 2 (Reference 3.9-201), APPENDIX A: Guidelines for Inservice Testing Program for Pumps and Valves at Nuclear Power Plants and APPENDIX B: Guidelines for Inservice Examination and Testing Program for Dynamic Restraints (Snubbers) at Nuclear Power Plants]. In addition, the development of the IST relies on the guidance provided in Sections 5 (Guidance for Developing and Implementing IST Programs) and 8 (IST Program Guidance for New Reactors) of~~ RCOL2_03.09.06-22 S01

~~NUREG-1482, as well as other applicable regulatory guidance documents referenced in these NUREG documents.~~ RCOL2_03.09.06-22 S01 RCOL2_03.09.06-22 CTS-01396

Aspects of the IST program will:

a. verify the appropriate Code Class for each component of the plant, identify the system boundaries for each class of components subject to test or examination, and identify the components exempt from testing or examination requirements

b. verify the design and arrangement of system components to include allowance for adequate access and clearances for conducting the tests and examinations (done as part of the initial design verification phase and for any subsequent plant modifications)

c. verify that appropriate IST requirements are captured in procurement specifications for ASME components

d. prepare plans and schedules for the implementation of the IST program and the performance of IST activities

e. prepare written test and examination instructions and procedures. In formulating program procedures, the appropriate code edition and addenda are to be identified and administratively controlled.

f. verify the qualification of personnel who perform and evaluate examinations and tests in accordance with the QAP

g. perform the required tests and examinations

h. record the required test and examination results that provide a basis for evaluation and facilitate comparison with the results of subsequent tests or examinations

i. evaluate tests and examination results

j. maintain adequate test and examination records in accordance with the QAP requirements

k. retain test and examination records for the service lifetime of the component or system

l. assure that any plant changes that impact IST requirements are evaluated and the IST program is adjusted accordingly

m. provide for the training of personnel assigned to perform IST functions

This COL item is addressed in Subsection 3.9.2.4.1.

3.9(3) *Deleted from the DCD.*

3.9(4) *Deleted from the DCD.*

3.9(5) *Deleted from the DCD.*

STD COL 3.9(6) ***3.9(6)*** ~~*Program plan for IST of dynamic restraints*~~*Program for IST of dynamic restraints in accordance with the ASME OM Code.* RCOL2_03.09.06-14 RCOL2_03.09.06-22 CTS-01465

This COL item is addressed in Subsection 3.9.6 and 3.9.6.4.

3.9(7) *Deleted from the DCD.*

STD COL 3.9(8) ***3.9(8)*** ~~*Administrative control of the edition and addenda used for the IST program*~~*Administrative control of the edition and addenda to be used for the IST program and to provide a full description of their IST program for pumps, valves, and dynamic restraints.* RCOL2_03.09.06-15 RCOL2_03.09.06-22

This COL item is addressed in Subsection 3.9.6.

3.9(9) *Deleted from the DCD.*

STD COL 3.9(10)
CP COL 3.9(10) ***3.9(10)*** *Site-specific active pumps*

This COL item is addressed in Subsection 3.9.3.3.1, and Table 3.9-201.

STD COL 3.9(11)
CP COL 3.9(11) ***3.9(11)*** *Site-specific, safety-related pump IST parameters and frequency*

This COL item is addressed in Subsection 3.9.6.2, and Table 3.9-202.

STD COL 3.9(12)
CP COL 3.9(12) ***3.9(12)*** *Testing and frequency of site-specific valves subject to IST*

This COL item is addressed in Subsection 3.9.6.3, and Table 3.9-203.

~~3.9.10 References~~ RCOL2_03.09.06-22 RCOL2_03.09.06-22 S01

~~Add the following reference after the last reference in DCD Subsection 3.9.10.~~

~~3.9-201 Guidelines for Inservice Testing at Nuclear Power Plants, NUREG-1482, Revision 2.~~